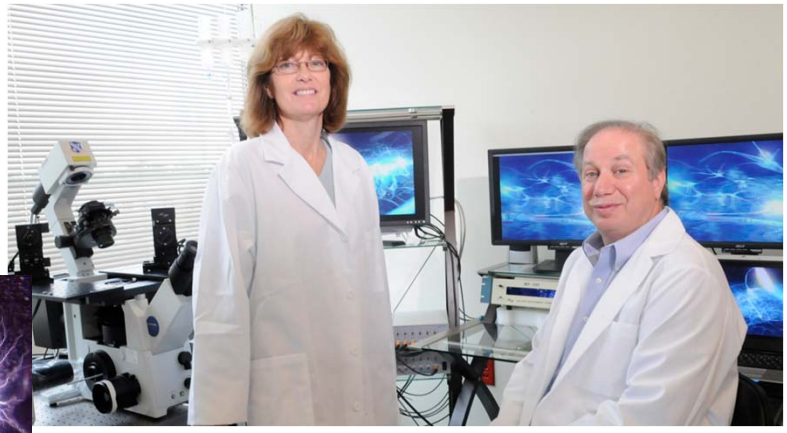
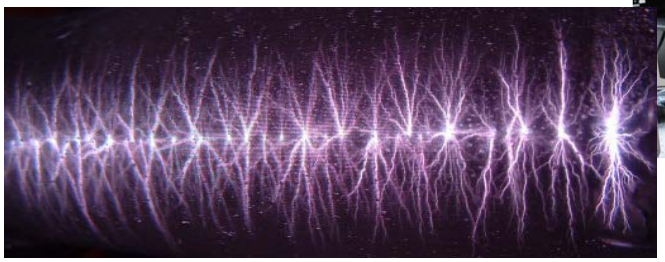
Frank Reidy Research Center for Bioelectrics

Dr. Richard Heller





OLD DOMINION UNIVERSITY

IDEA FUSION

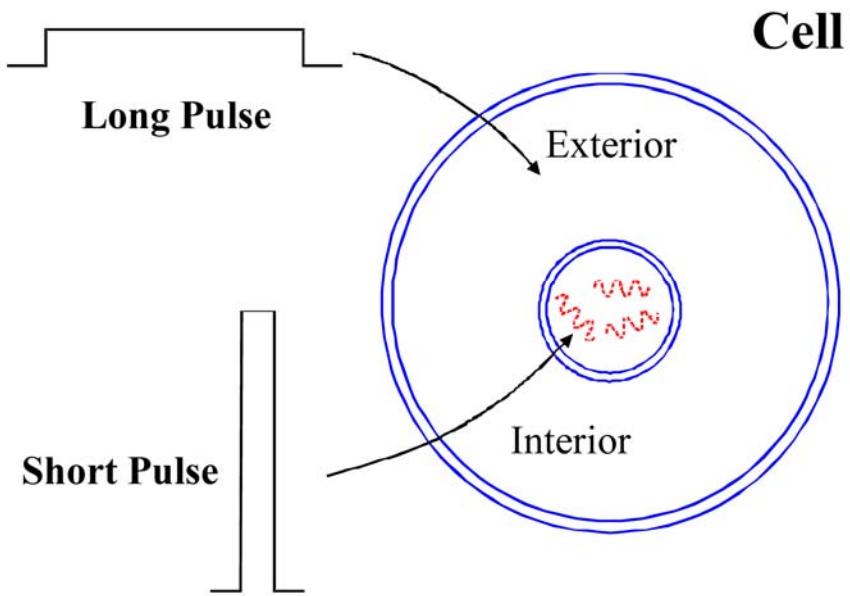
Frank Reidy Research Center for Bioelectrics

Reidy Center for Bioelectrics

- University Level Research Center
  - Founded in 2002
  - 55 Researchers: Faculty, Post-docs, students, technicians and staff
- Leader in an International Consortium on Bioelectrics
  - Japan, Germany (2), France (2), Czech Republic, Slovenia, Italy (2), Denmark, Netherlands, Portugal and United States (3)

Pulsed Power: Affect Cell Functions

[from delivery of molecules to release of calcium and induction of apoptosis]



Bioelectric Applications

Cellular Interactions

- Cellular and Molecular Biology – membrane interactions, blebing, poration
- Intercellular – apoptotic pathways

Wound Healing

- Platelet gels - nanosecond pulse electric fields to activate platelets
- Gene therapy – delivery of plasmids encoding angiogenic factors to accelerate wound healing

Plasma

- Use of cold plasma to destroy bacteria
  - prevention of wound infections
  - decontamination of food
  - decontamination of surfaces
- Other applications
  - removal of NOx from diesel exhaust
  - air purification
  - fuel reforming
  - extraction of radioactive tritium
  - chemical decontamination
  - water purification

Bioelectric Applications

Treatment of Cancer

- Ablation therapy – nanosecond pulse electric fields to destroy tumor cells – work performed in melanoma, squamous cell carcinoma, liver cancer, pancreatic cancer and breast cancer
- Gene therapy – micro-millisecond pulse electric fields to deliver plasmid DNA to stimulate immune system. Phase I and Phase II clinical trials successfully completed.

Stimulation

- Use of picosecond pulse electric fields to stimulate neurons

Cardiovascular

- Coronary artery disease – gene therapy to assist revascularization
- Peripheral vascular disease - gene therapy to assist revascularization

DNA Vaccines

- Infectious disease
- Cancer

Neurological Applications

- Pain control

Commercialization and Partnerships

- **Nanosecond ablation technology**
  - **Two current licenses – skin and internal tumors**
  - **Merge two current licensees with new partner**
    - **Cancer**
    - **Cosmetics**
    - **Heart**
    - **Stimulation**
- **Plasma**
  - **New company for chemical disinfection**
  - **Engine manufacturer for NOx reduction**
- **Wound healing**
  - **Platelet gel - Negotiating license**
- **Ischemia**
  - **Talks initiated**

Center for Bioelectrics – Previous Allocation

- **Expansion**
  - **Recruit new faculty –**
    - Cardiovascular – partnership with Sentara Heart Hospital - $2 million endowment
    - Plasma (2) – plasma medicine and basic science
    - Infectious disease – vaccines
    - Immunology
    - Modeling – molecular dynamics
    - Neuroscience
  - **Impact of new faculty**
    - Over $4 million in external research support received or being transferred – mainly federal sources
- **Additional space**

Center for Bioelectrics – Proposed Allocation

- **Expansion**
  - **Recruit additional faculty –**
    - Lung injury expert – negotiating possible partnership
    - Cancer immunologist
    - Tumor biologist
    - Neuroscience
  - **Increase level of external funding**
  - **Increase national and international recognition**
- **Enhance partnerships**
  - **New product development - license or spin out**
    - Cardiovascular applications –
    - Plasma – additional product development
    - Diabetes - EVMS
    - Wound healing – gene based approach
    - Ischemia

Center for Bioelectrics - Future

- Electric/electromagnetic fields are powerful tools
  - **Tremendous translational opportunities**
  - **Multiple new applications**
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odu.edu/bioelectrics